**IN THE CLAIMS**

**Please cancel claim 83**

5. [CURRENTLY AMENDED] A central unit modem apparatus comprising:

a framing circuit having a memory and circuitry to receive downstream data and store said downstream data ~~store it~~ in said memory organized as frames of data each frame comprising one or more symbols, and having circuitry to read data out of said memory and present said downstream data at an output;

a transmitter coupled to receive said downstream data from said output and having circuitry to multiplex said downstream data onto a transmission media using any form of multiplexing and any form of modulation, said transmitter including a ranging means for transmitting ranging data to be received by a plurality of remote unit modems to assist them in performing a ranging process so as to achieve upstream frame synchronization; and

a synchronous code division multiplexed receiver coupled to receive modulated upstream signals from a plurality of remote unit modems and having circuitry to demodulate and demultiplex said upstream signals and detect upstream data from said demodulated, demultiplexed upstream signals.

6. [currently amended] The apparatus of claim 5 wherein said transmitter includes circuitry to transmit downstream information defining a ~~the~~ phase and frequency of a master clock signal and a master carrier signal, and wherein said upstream signals include signals therein which define the phase and frequency of clock and carrier signals used in said remote unit modems to generate said upstream signals,

and wherein said synchronous code division multiplexed receiver includes tracking loop circuitry to track the phase and frequency of the clock and carrier signals used by each remote unit modem and generate clock and carrier signals locked in phase and frequency to the clock and carrier signals used in said remote unit modem to generate said upstream signals, and circuitry to use said generated clock and carrier signals to demodulate and demultiplex said upstream signals and detect said upstream data from said demodulated, demultiplexed upstream signals.

7. (PREVIOUSLY AMENDED) The apparatus of claim 5 wherein said transmitter includes circuitry to transmit downstream information defining the phase and frequency of a master clock signal and a master carrier signal, and wherein said upstream signals include signals therein which define the phase and frequency of the clock and carrier signals used by said remote unit modems to generate said upstream signals wherein said clock and carrier signals used in said remote unit modems to generate said upstream signals are locked in phase and frequency with or are at least phase coherent with, master clock and master carrier signals recovered from said downstream information transmitted by central unit transmitter and wherein said upstream signals include preamble data transmitted by each remote unit modem prior to transmission by that remote unit modem of any upstream payload data, and wherein said synchronous code division multiplexed receiver include circuitry to use said preamble data from each remote unit modem to determine phase and amplitude correction factors for use in said synchronous code division multiplexed receiver along with said master clock and master carrier signals to receive data transmitted by that particular remote unit modem and for storing said amplitude and phase correction factors for each remote unit modem in

memory and wherein said synchronous code division multiplexed receiver includes circuitry for demodulating and demultiplexing said upstream signals and detecting upstream data therein.

28. (PREVIOUSLY AMENDED) A bidirectional digital data communication system including a central unit transceiver having circuitry for accepting downstream data from multiple sources organized into a time division multiplexed stream of data and assembling symbol data therefrom, and including multiplexer and modulator circuits for code division multiplexing said downstream symbol data and modulating the resulting multiplexed data onto one or more radio frequency carriers and transmitting the resulting downstream radio frequency signals on a shared media and including a plurality of remote unit transceivers including demodulating and demultiplexing and detecting circuitry to demodulate said downstream signals and demultiplex the resulting demodulated signals and detect the symbols that were transmitted and output the downstream data that was to assemble each symbol, and including deframer circuitry for receiving the resulting detected downstream data and reassembling a time division multiplexed stream of downstream data therefrom, said remote unit transceivers including circuitry to receive upstream data from multiple sources in time division multiplexed streams and assemble upstream symbols therefrom, and including multiplexing and modulator circuitry to code division multiplex said upstream symbol data and modulate the resulting multiplexed data onto one or more radio frequency carriers and transmit the resulting upstream radio frequency signals on said shared media using frequency division multiple access to separate the upstream radio frequency signals from the downstream radio frequency signals, said central unit transceiver

including demodulator and demultiplexing circuitry to demodulate and demultiplex the upstream radio frequency siganls and detector circuitry to detect the upstream symbols that were transmitted by each remote unit transceiver and output the upstream data that was used to compose each upstream symbol, and including deframer circuitry to receive the detected upstream data and reassemble a time division multiplexed data stream therefrom.

72. (CURRENTLY AMENDED, PREVIOUSLY AMENDED) A head end modem for providing multiple-user, multiple-source simultaneous digital communication over a limited bandwidth with one or more remote unit modems in a distributed systems linked by a transmission medium, comprising:

a framing and addressing and packetizing ~~framing/addressing/packetizing~~ circuit for receiving payload data bytes and organizing said payload data into frames and organizing said payload data such that information as to which remote unit modem and peripheral each payload data byte is directed can be determined;

a master clock for generating a master clock signal;

a master carrier local oscillator for generating one or more carrier signals which will be modulated with digital data to be transmitted;

a transmitter for receiving said payload data from said framing and addressing and packetizing ~~framing/addressing/packetizing~~ circuit and said master clock signal and said one or more carrier signals and using said payload data to modulate said one or more carrier signals using any modulation process which can also transmit said master clock reference signal and said carrier signals to said remote unit modems for use there for synchronization including

synchronization to said frame boundaries, said transmitter coupled to said transmission media so as to output said one or more modulated carrier signals as downstream radio frequency signals; and

~~an~~ a synchronous code division multiplexed receiver coupled to receive upstream radio frequency signals modulated with upstream data transmitted by said remote unit modems, said receiver coupled to said master clock and said master carrier local oscillator to receive said master clock signal and said master clock local oscillator, said synchronous code division multiplexed receiver functioning to synchronously extract said upstream data from said upstream radio frequency signals by performing an ~~the~~ inverse code transformation of a code transformation which was performed by an synchronous code division multiplexed transmitter in a remote unit modem which modulated said upstream radio frequency signals by spreading a ~~the~~ spectrum thereof using orthogonal, pseudorandom spreading codes assigned to that remote unit modem, said extracted upstream data being presented at an output;

a gap monitor circuit coupled to said synchronous code division multiplexed receiver for aiding t~~he process of achieving~~ frame synchronization by said remote unit modems by monitoring an interval during each numbered upstream frame for a ~~the~~ presence of ranging signals transmitted by said remote unit modems and for generating status data indicating how many ranging signals have been received during said interval and, after only ranging signals from one remote unit modem are being received during said interval, which intervals have received ranging signals so as to identify the remote unit modem which transmitted said ranging signals;

a circuit for receiving said status data from said gap monitor circuit and generating suitable management and control data needed by the remote unit modems to achieve frame synchronization such that all numbered upstream frames having the same upstream frame ~~of like~~ number and being transmitted by the various remote unit modems at different locations arrive at said central unit modem at the same time with their frame boundaries aligned in time.

74. [CURRENTLY AMENDED] A transmitter apparatus for simultaneously transmitting to a receiver multiple channels of digital data over a cable television media carrying cable television programming, comprising:

a framer circuit for receiving a time division multiplexed stream of data comprised of N timeslots per frame, each timeslot carrying digital data from one of N channels, said framer for storing in a memory the data from selected ones of said timeslots assigned to said transmitter, and for generating an information vector having N elements corresponding to said N timeslots, predetermined ones of said information vector elements corresponding to said selected timeslots assigned to said transmitter from which data was stored by said framer circuit, each of said predetermined elements of said information vector corresponding to timeslots assigned to said transmitter comprised of a plurality of bits which constitute a fraction of the data of one of said timeslots assigned to said transmitter;

a convolutional encoder for selectively adding one or more redundant bits to each element of said information vector to implement trellis modulation to generate a new information vector;

a code division multiplexer circuit for matrix multiplying said new information vector times a code matrix comprised of N mathematically orthogonal codes, each row comprised of an orthogonal code having N elements to generate a result vector having N elements;

a modulator for using each element of said result vector to quadrature amplitude modulate two radio frequency carriers having the same frequency but separated in phase by 90 degrees to generate inphase and quadrature RF signals, said modulation being achieved by dividing the bits of each element of said result vector into first and second parts and using a ~~the~~ number represented by each part to define a ~~the~~ amplitude of said inphase and quadrature RF signals, respectively, and summing said inphase and quadrature RF signals prior to transmission on said cable television media;

means for achieving frame synchronization between frames transmitted by said transmitter apparatus and the frame boundaries of frames within said receiver.

75. [CURRENTLY AMENDED] The apparatus of claim 74 further comprising a scrambler circuit coupled to receive elements of said information vector from said framer circuit, pseudorandomly scramble ~~the~~ bits of each element thereof to generate a scrambled information vector, and transmit said scrambled information vector to said convolutional encoder and wherein said convolutional encoder encodes the elements of said scrambled information vector with redundant bits.

76. [CURRENTLY AMENDED] The apparatus of claim 75 wherein said

convolutional encoder has an idle mode wherein only zeroes are added as redundant bits, a normal mode wherein a first selected number of redundant bits are added to each element of the information vector based upon the data selected from a ~~the~~ same timeslot of an earlier time to generate a ~~the~~ same element of a previous information vector, and a fallback mode wherein a number of redundant bits larger than said first selected number of redundant bits are added to each element of said information vector to generate said new information vector, the mode in which said convolutional encoder operates being selectable by manipulation of a mode control signal transmitted to a mode control input of said convolutional encoder.

77. [CURRENTLY AMENDED] The apparatus of claim 76 further comprising code diversity means coupled to said framer circuit for controlling an ~~the~~ order in which said information vector elements are read from said framer circuit and input to said scrambler circuit, and further comprising a buffer memory for storing said scrambled information vector, said code diversity means controlling the locations in said buffer memory in which is stored each scrambled element of said scrambled information vector.

78. (CURRENTLY AMENDED, PREVIOUSLY AMENDED) The apparatus of claim 75 further comprising a precode filter coupled to receive at least said elements of said result vector and including means for performing ~~an~~ equalization ~~process~~ thereon to predistort said result vector elements prior to transmission to generate predistorted result vector elements and wherein said modulator uses said predistorted result vector elements to generate said inphase and quadrature RF signals such that said inphase and

quadrature RF signals arrive at said receiver with substantially less distortion caused by impairments encountered in propagating along said cable television medium, said precode filter having an input for receiving a coefficient signal which controls the characteristics of a ~~the~~ predistortion function applied to to the elements of said result vector.

79. [ORIGINAL] The apparatus of claim 78 wherein said coefficient signal is set so as to establish said characteristics of said predistortion function based upon the position of the transmitter on said cable television media and the impairments then existing which will affect signals transmitted from a transmitter at that position.

80. [CURRENTLY AMENDED] The apparatus of claim 75 further comprising and equalization filter for receiving said result vector from said code division multiplexer circuit and filtering it using a digital filter with predetermined filter coefficients to generated an equalized result vector, and further comprising a scaling amplifier coupled to receive said equalized result vector and functioning to scale said equalized result vector in accordance with a scaling factor to generate scaled result vector elements, and a shaping filter coupled to receive said scaled result vector elements before they are supplied to said analog to digital converter, said shaping filter having a raised cosine transfer function suitable to limit the bandwidth of the combined RF signal generated by summing said inphase and quadrature RF signals and suitable to satisfy ~~the~~ Nyquist criteria so as to optimize signal-to-noise ratio and minimize interference with signals from other transmitters coupled to said cable television media.

81. (CURRENTLY AMENDED, PREVIOUSLY AMENDED) The apparatus of claim 75 wherein each timeslot contains 8 bits of data to which a 9th bit is added, said 9th bit encoded with predetermined nonpayload information, and wherein said framer circuit stores all 9 bits in memory locations in memory, and wherein data is read out from said framer circuit in frames, each frame comprised of three symbols, each symbol having N elements corresponding to the N elements of an information vector, and wherein, during each frame, said framer circuit outputs three sequential information vectors from which the three sequential symbols of the frame will be generated, the elements of each of said three sequential information vectors each corresponding to a timeslot currently assigned to said transmitter, each said element containing three of the nine bits from the corresponding assigned timeslot, said three bits hereafter called a tribit, and wherein said convolutional encoder, when operating in normal mode, adds a 4th redundant bit to each tribit to generate the elements of said new information vector prior to said matrix multiplication carried out by said code division multiplexer circuit on said new information vector.

82. [ORIGINAL] The apparatus of claim 75 wherein said code division multiplexer circuit generates each of said N mathematically orthogonal codes from a cyclic code and is structured to perform said matrix multiplication by generating one orthogonal code, multiply each code element of the code so generated by a corresponding element of said new information vector, and sum the partial products to generate an element of said result vector and then generate the next orthogonal code from the cyclic code and repeat the process to generate the next element of said result vector.

83. [Cancelled] ~~A system for bidirectional communication of digital data comprising:~~

~~a central unit comprising a code division multiple access transmitter and a code division multiple access transmitter;~~

~~a transmission media coupled to said central unit transmitter and receiver;~~

~~a plurality of physically distributed remote units coupled to said central unit by said transmission media, each remote unit having a code division multiple access transmitter and a code division multiple access receiver;~~

~~and wherein said central unit transmitter includes means for assigning each remote unit one or more codes from a set of orthogonal codes and wherein each said remote unit transmitter and said central unit transmitter include means for using said orthogonal codes assigned to that remote unit to encode all payload data intended for exchange between said remote unit and said central unit;~~

~~and wherein each said transmitter includes a modulator to use said digital data, after encoding using said orthogonal codes, to modulate a radio frequency carrier to generate modulated RF signals for transmission on said transmission media;~~

~~and wherein said transmitters in said central unit and said remote units are structured to transmit said modulated RF signals in frames, each frame defined as one or more symbols comprising encoded payload data and a guardband during which no payload data is transmitted, each frame separated from adjacent frames by said guardband;~~

~~and wherein central unit transmitter includes a circuit to transmit a~~

~~barker code during each frame;~~

~~——— and wherein each remote unit transmitter includes means for carrying out a trial and error process of adjusting a transmit frame timing delay and transmitting said barker code back toward said central unit, hereafter referred to as the ranging process, and wherein each central unit receiver includes means for monitoring each guardband to determine when a barker code transmitted by a single remote unit transmitter has arrived during said guardband or if multiple barker codes have arrived, and wherein said central unit transmitter is coupled to said central unit receiver and receives status information therefrom regarding whether a single or multiple barker codes have been received within a guardband and transmits said status information to said remote units, and wherein each remote unit receiver includes means for monitoring said status information transmitted from said central unit and for receiving information from said remote unit transmitter regarding whether said remote unit transmitter is currently carrying out said ranging process, and, when said status information received from said central unit indicates only a single barker code was received during said guardband and information from said remote unit transmitter indicates that remote unit is currently carrying out said ranging process, said remote unit receiver controls said remote unit transmitter to transmit an identification code unique to only that remote unit, and wherein said central unit receiver includes means to determine what identification code was received and to control said central unit transmitter to transmit the received identification code back to all remote units, and wherein said remote unit receivers includes means for comparing the identification code transmitted by~~

~~said central unit to the identification code of said remote unit, and, if there is a match, for controlling said remote unit transmitter to set said transmit frame timing delay at the delay value which resulted in said barker code arriving at said central unit during said guardband.~~

~~85.~~ 84. [CURRENTLY AMENDED] A head end apparatus comprising:

a master clock for generating a master clock signal;

a master carrier local oscillator for generating a master carrier signal;

a demodulator coupled to receive at least ~~master~~ clock signals from said master clock, for demodulating received radio frequency carriers modulated with upstream data by one or more remote unit modems and output ~~ouput~~ one or more result vectors of multiplexed upstream data, each result vector comprised of a plurality of chips;

a ranging means for receiving said chips output by said demodulator and perform ranging detection to assist remote unit modems to achieve upstream frame synchronization;

a demultiplexer coupled to receive said result vectors and a clock signal from said master clock and functioning to demultiplex the data in said result vectors so as to output one or more information vectors, each information vector comprised of a plurality of received constellation points, wherein each constellation point ~~of which~~ may or may not be corrupted by channel impairments; and

adjustment means for receiving said information vectors transmitted by each said remote unit modem and using preamble data therein to correct for

phase and amplitude errors in data transmitted by each said remote unit modem and outputting corrected information vectors, each corrected information vector comprised of corrected constellation points;

a detector comprised of at least a slicer coupled to receive said master clock and said corrected constellation points of said corrected information vectors and functioning to detect and output an ~~the~~ actual upstream data corresponding to each said corrected constellation point that was transmitted by each said remote unit modem.

~~86~~. 85. [CURRENTLY AMENDED] The apparatus of claim 84 ~~85~~ wherein said demodulator, demultiplexer, adjustment means and detector are all part of a synchronous time division multiplexed data receiver, and wherein said demodulator uses both said master carrier and said master clock signals to demodulate said radio frequency signals modulated with upstream data.

~~87~~. 86. [CURRENTLY AMENDED] The apparatus of claim 84 ~~85~~ wherein said demodulator, demultiplexer, adjustment means and detector are all part of a synchronous code division multiplexed data receiver and wherein said demodulator uses both said master carrier and said master clock signals to demodulate said radio frequency signals modulated with upstream data.

~~88~~. 87. [CURRENTLY AMENDED] The apparatus of claim 84 ~~85~~ further comprising a downstream transmitter of any type to transmit downstream data to said remote unit modems, and wherein said demodulator, demultiplexer, adjustment means

and said detector are all part of an upstream receiver.

~~89~~. 88. [CURRENTLY AMENDED] The apparatus of claim 87 ~~88~~ wherein said demodulator, demultiplexer, adjustment means and detector are all part of a synchronous code division multiplexed data receiver, and wherein said downstream transmitter is structured to transmit spreading code assignment data which said remote unit modems use to determine which spreading codes to use during specific upstream frames and further is structured to transmit a pilot channel signal which encodes a kiloframe marker which said remote unit modems use to count upstream frames so that the assigned spreading codes will be used to multiplex upstream data during the assigned upstream frames.

~~90~~. 89. [CURRENTLY AMENDED] The apparatus of claim 87 ~~88~~ wherein said downstream transmitter is structured to transmit a pilot channel signal which encodes a kiloframe marker which said remote unit modems use to count upstream frames, and further comprising boundless ranging means for transmitting downstream frames to said remote unit modems and counting downstream frames and for responding to upstream boundless ranging requests from said remote unit modems by determining a total turnaround time for the remote unit modem that transmitted said boundless ranging request by determining the difference in frame numbers between an upstream frame number included in said boundless ranging request and the current downstream frame count at the time of receipt of said upstream boundless ranging request and transmitting said total turnaround time to said remote unit modem that transmitted said upstream boundless ranging request.

~~91~~. 90. [CURRENTLY AMENDED] The apparatus of claim 84 ~~85~~ further comprising any downstream transmitter for transmitting downstream data in frames and transmitting a barker code between or during each said frame which encodes said master clock so that said master clock may be recovered by each said remote unit modem and used for transmitting said upstream data.

~~92~~. 91. [CURRENTLY AMENDED] The apparatus of claim 87 ~~88~~ wherein upstream frame transmitted by said remote unit modem have numbers and wherein said downstream transmitter transmits downstream data in frames separated by gaps, and is structured to transmit a downstream ranging signal, and wherein said downstream transmitter cooperates with said ranging means to transmit ~~upstream receiver includes ranging means for monitoring upstream transmissions during said gaps for receipt of upstream ranging signals and for transmitting~~ downstream data to said remote unit modems which can be used by said remote unit modems to adjust their transmit frame timing delays so that all upstream frames transmitted by all said remote unit modems having the same upstream frame number have their frame boundaries aligned in time when they arrive at said central unit modem.

~~93~~. 92. [CURRENTLY AMENDED] The apparatus of claim 91 ~~92~~ further comprising prechannel equalization filter in said downstream transmitter for filtering transmitted signals to compensate for channel impairments in the downstream channel, and post channel equalization circuitry in said upstream receiver for compensating for channel impairments in upstream channels from said remote unit modems.

~~94~~. 93. [CURRENTLY AMENDED] The apparatus of claim 87 ~~88~~ further comprising transmitter ranging means in said downstream transmitter coupled so as to cooperate with said ranging means in ~~and~~ said upstream receiver so as to transmit ~~for transmitting~~ ranging signals to said remote unit modems ~~and receiving ranging transmissions from said remote unit modems and transmitting data to said remote unit modems~~ that enables each remote unit modem to achieve upstream frame synchronization, and wherein said upstream receiver is a synchronous code division multiplexed receiver, and futher comprising training means in said downstream transmitter and said upstream receiver for receiving training data transmitted by a remote unit modem on a particular spreading code after said remote unit modem has achieved upstream frame synchronization, and for checking the accuracy of said upstream frame synchronization and for transmitting adjustment data to said remote unit modem to be used by said remote unit modem to achieve greater precision in upstream frame synchronization if said training data is not received properly on the spreading code used to transmit said training data.

~~95~~. 94. [CURRENTLY AMENDED] The apparatus of claim 93 ~~94~~ wherein said training means includes power alignment means for computing a new power level for use by said remote unit modem which transmitted said training data based upon the degree of success in receiving said training data transmitted on said particular spreading code of said upstream frame synchronization and transmitting said new power level to said remote unit modem.

~~96~~. 95. [CURRENTLY AMENDED] The apparatus of claim 87 ~~88~~ further comprising power alignment means for receiving training data transmitted by each remote unit modem and adaptively adjusting to a gain correction factor which minimizes receive errors and transmitting the gain level which caused minimum errors to said remote unit modem which transmitted said training data.

~~97~~. 96. [CURRENTLY AMENDED] The apparatus of claim 87 ~~88~~ further comprising upstream equalization means in said downstream transmitter and said upstream receiver for deriving filter coefficients that equalize channel impairments in an upstream channel between a remote unit modem and said head end apparatus during ~~the process of~~ receiving of iterative transmissions of training data transmitted by a remote unit modem, and then transmitting said filter coefficients to said remote unit modem which transmitted said training data for use in generating new coefficients for use by said remote unit modem in subsequent upstream transmissions.

~~98~~. 97. [CURRENTLY AMENDED] A process for receiving upstream data in a central unit modem transmitted by a plurality of remote unit modems in a digital data communication system comprised of a plurality of remote unit modems coupled to said central unit modem by a shared transmission medium, comprising the steps of:

generating a master clock signal in said central unit modem;

generating a master carrier signal in said central unit modem;

transmitting data to said remote unit modems from which said master clock and master carrier signals can be recovered in each remote unit modem;

using at least said master clock signal in said central unit modem to

demodulate upstream radio frequency transmissions from said remote unit modems that contain upstream data to generate one or more result vectors of multiplexed upstream data, each result vector having a plurality of chips as elements thereof;

receiving said chips output by said demodulator and perform ranging detection to generate data to assist each remote unit modem to achieve precise upstream frame synchronization;

demultiplexing said result vectors using said master clock so as to generate one or more information vectors, each information vector comprised of a plurality of received constellation points wherein each constellation point ~~of which~~ may or may not be corrupted by channel impairments;

using known preamble data transmitted by each remote unit modem as part of upstream data transmitted by that remote unit modem to derive amplitude and phase error correction factors for use in receiving upstream data transmitted by that remote unit modem and using said amplitude and phase error correction factors to correct each said received constellation point to generate a corrected constellation point;

detecting the actual upstream data that corresponds to each said corrected constellation point synchronously using ~~with~~ said master clock.

~~99~~. 98. [CURRENTLY AMENDED] The process of claim 97 ~~98~~ wherein said demodulating step is accomplished by generating from said master clock signal a carrier signal matched in frequency to the upstream carrier signal used by each remote unit

modem to transmit upstream data.

~~100~~. 99. [CURRENTLY AMENDED] The process of claim 97 ~~98~~ wherein said demultiplexing step comprises demultiplexing time division multiplexed upstream data.

~~101~~. 100. [CURRENTLY AMENDED] The process of claim 98 ~~99~~ wherein said demultiplexing step comprises despreading the spectrum of spread spectrum multiplexed upstream.

~~102~~. 101. [CURRENTLY AMENDED] The process of claim 97 wherein each upstream frame transmitted by a remote unit modem has a number, and ~~98~~ further comprising the steps of transmitting a ranging signal downstream for use by said remote unit modems in achieving frame synchronization, ~~and receiving upstream ranging transmissions from said remote unit modems~~ and transmitting ranging data downstream, said ranging data derived from said step of receiving said chips output by said demodulator and perform ranging detection, said ranging data being generated for each remote unit modem and being used by said remote unit modem for which said ranging data was generated ~~which can be used by each remote unit modem~~ to achieve precise upstream frame synchronization such that each upstream frame transmitted by said remote unit modem having any particular upstream frame number arrives at said central unit modem with its frame boundaries aligned in time with the frame boundaries of other upstream frames having the same upstream frame number which were transmitted by other remote unit modems.

~~103~~. 102. [CURRENTLY AMENDED] The process of claim 101 ~~102~~ further comprising the steps of:

counting downstream frames in said central unit modem;

transmitting data downstream which encodes a kiloframe marker signal which said remote unit modems can use to count upstream frames;

receiving an upstream boundless ranging request from a remote unit modem containing the current downstream frame count at said remote unit modem as counted by said remote unit modem using said kiloframe marker signal and responding by calculating a total turnaround time as the difference between the current downstream frame count in said central unit modem at the time said boundless ranging request was received and said frame count included in said boundless ranging request;

transmitting said total turnaround time to said remote unit modem which transmitted said boundless ranging request;

and further comprising the steps of:

receiving upstream bandwidth requests from one or more remote unit modems and performing an allocation of upstream logical channels using any allocation scheme;

transmitting messages to said remote unit modems awarding logical channels to said remote unit modems for specifically designated upstream frames in accordance with ~~the~~ results of said allocation.

~~104~~. .103 [CURRENTLY AMENDED] The process of claim 101 ~~102~~ further comprising the steps of from time to time performing a training process to check the

accuracy of said frame synchronization and cause any remote unit modems which are not exactly in frame synchronization to be adjusted, and adjusting the power level of transmissions by each said remote unit modem such that transmissions from each said remote unit modem arrive at said central unit modem at a power level that minimizes reception errors by receiving training data transmitted by a remote unit modem and allowing an adaptive gain control circuit in said central unit modem to change its gain adaptively to minimize reception errors and then transmitting the gain level settled upon to the remote unit modem and setting the gain of said adaptive gain control circuit to one during reception of transmission from the remote unit modem whose gain has been so adjusted, and for developing filter coefficients for upstream precode equalization filters in each said remote unit modem in said central unit modem and transmitting said coefficients developed for each said remote unit modem to said remote unit modem for use in adjusting coefficients of an upstream precode equalization filter therein, and for transmitting training data to a remote unit modem having a ~~the~~ spectrum spread by each of a plurality of adjacent cyclic spreading codes to allow said remote unit modem to adapt the coefficients of the downstream equalization filters therein to adjust for downstream channel impairments.

~~105~~. 104. [CURRENTLY AMENDED] A process for bidirectional synchronous time division multiplexed communication of digital data to a central unit modem connected from a plurality of remote unit modems over a shared transmission medium, comprising the steps of:

generating a master clock signal in said central unit modem;

generating a master carrier signal in said central unit modem;

transmitting data to said remote unit modems from which at least said master clock can be recovered in each remote unit modem, and transmitting downstream data in frames using any modulation and multiplexing scheme including no multiplexing such that each frame is broadcast to all remote unit modems;

using said master clock signal and said master carrier signal in said central unit modem and using known preamble data transmitted by each remote unit modem as part of upstream data transmitted by that remote unit modem to derive amplitude and phase error correction factors for use in receiving upstream data transmitted by that remote unit modem;

receiving upstream ranging data transmitted by each said remote unit modem, and performing ranging detection thereon to generate downstream ranging data for transmission to each remote unit modem to assist each remote unit modem to achieve precise upstream frame synchronization and transmitting said downstream ranging data developed for each remote unit modem to said remote unit modem;

using said master clock signal and said master carrier signal in said central unit modem to demodulate and demultiplex upstream data transmitted as a plurality of time division multiplexed constellation points by each remote unit modem and using said amplitude and phase error correction factors developed for each remote unit modem to recover the upstream data encoded in each received constellation point.

~~106.~~ 105. [CURRENTLY AMENDED] A transceiver circuit in a central unit

modem apparatus for providing multiple user simultaneous access for supplemental digital data services via a shared transmission medium coupled between said central unit modem and a one or more physically distributed remote unit modems, comprising:

a transmitter comprising:

a master clock;

means for generating a master carrier;

~~any~~ transmitter means for receiving downstream data intended for said remote unit modems and transmitting said downstream data to said remote unit modems using said master clock and said master carrier, said transmitter means including means for transmitting data encoding said master clock and said master carrier to all said remote unit modems on one or more radio frequency carriers in a first frequency band and for transmitting downstream ranging data to said remote unit modems;

a synchronous code division or synchronous time division multiplexed receiver means for receiving ranging transmissions transmitted by said remote unit modems and for generating downstream ranging data for transmission to said remote unit modems to assist them in achieving upstream frame synchronization and transmitting said downstream ranging data to said transmitter means for downstream transmission, and using at least said master clock and master carrier and preamble data transmitted by each said remote unit modem prior to transmission of upstream payload data to demodulate, demultiplex and recover upstream payload data transmitted by multiple remote unit modems where each said ~~sai~~ remote unit modem uses a recovered master clock on one or more carriers synchronized to a recovered version of said master

carrier but frequency translated to a second frequency band that does not interfere with ~~said~~ a first frequency band in which said master carrier is transmitted, said remote unit modems transmitting simultaneosly on said second frequency band using synchronous code division multiplexing or synchronous time division multiplexing to separate the upstream payload data transmitted by each remote unit modem.

~~107.~~ 106. [CURRENTLY AMENDED] The apparatus of claim 105 ~~106~~ further comprising means for receiving bandwidth requests from said remote unit modems, and for awarding bandwidth in accordance with any scheme to arrive at one or more bandwidth awards, and for allocating spreading codes or timeslots for use by said remote unit modems identified in said bandwidth awards in transmitting upstream frames in accordance with said bandwidth awards, and for transmitting said bandwidth awards in downstream management and control message to said remote unit modems indicating which spreading codes or timeslots specified remote unit modems are to be used to transmit upstream data in specified frames or to spread a ~~the~~ spectrum of data in specified upstream frames identified in said downstream messages.